Reg. No.: ....

Name : ....

IV Semester B.C.A. Degree (CCSS – Reg./Supple./Improve.) Examination, May 2015
COMPLEMENTARY COURSE IN MATHEMATICS FOR B.C.A.
4 C 04 MAT (BCA) : Operation Research

Time : 3 Hours Max. Weightage : 30

Answer **all** questions. Weightage for a bunch of **4** questions is **1**.

1. Fill in the blanks :

   a) A feasible solution which optimises the objective function is known as ____________

   b) The variables whose values are not restricted to zero in the current basic solution are listed in one column of the Simplex table is known as ________

   c) A price which indicates the amount by which the optimal value of the objective function would change if any constraint is changed marginally is called __________

   d) Activities which do not take time or resources are known as __________

   e) The name of the probability distribution used in PERT which estimates the expected duration and the expected variance of the activity is ________

   f) A linear programming problems in which all the variables in the optimum solution is restricted to assume non negative integer value is called ____________

   g) The Dynamic Programming technique was developed by ___________ in 1950.

   h) The time between starting the first job and completing the last job is known as _____________

(Wt : 2×1=2)

P.T.O.

Answer **any 6** questions (**Wt : 1 each**).

2. Write the standard form of an LPP.
3. How to find the dual of a given primal ?
4. Distinguish between CPM and PERT.
5. Write the Mathematical formulation of a Transportation Problem.
6. Give the different phases in the application of Network technique.
7. What do you meant by Travelling Salesman problem ?
8. Write the Mathematical modelling of integer programming problem.
9. Give the difference between Dynamic Programming and Linear Programming.
10. What is meant by "no passing rule" in sequencing ? **(Wt : 6×1=6)**

Answer **any 7** questions (**Wt : 2 each**).

11. Solve the following LPP by graphical method.

Max : $Z = 2x_1 + 3x_2$

S.t : $x_1 + x_2 \leq 30$

$x_2 \geq 3$

$0 \leq x_2 \leq 12$

$x_1 - x_2 \leq 0$

$0 \leq x_1 \leq 20 ; x_1, x_2 \geq 0.$

12. Write down the dual of the following problem :

Min : $Z = 2x_1 + 3x_2$

S.t : $x_1 + x_2 \geq 10$

$2x_1 + 3x_2 \geq 24$

$x_1, x_2 \geq 0.$

13. Find the initial feasible solution to the transportation problem given below by north west corner rule.

Origin	**Destination** D_1	D_2	D_3	**Supply**
O_1	2	7	4	5
O_2	3	3	1	8
O_3	5	4	7	7
O_4	1	6	2	14
Demand	7	9	18	

14. Solve the following minimal assignment problem :

Job	**Man** 1	2	3	4
I	12	30	21	15
II	18	33	9	31
III	44	25	21	21
IV	14	30	28	14

15. The following table gives the activities in a construction project and other relevant information.

Activity	1 – 2	1 – 3	2 – 3	2 – 4	3 – 4	4 – 5
Duration	20	25	10	12	6	10

i) Draw the network for the project.

ii) Which are the critical activities ?

16. Use Branch and Bound Technique, solve the following :

Max : $Z = 2x_1 + 2x_2$

S.t : $5x_1 + 3x_2 \le 8$

$x_1 + 2x_2 \le 4$

$x_1,\ x_2 \ge 0$ and integers.

[Use graphical method to solve the LPP]

17. Use Bellman's principal of optimality to find the optimum solution.

Maximize : $Z = x_1 \cdot x_2 \cdot x_3$

S.t : $x_1 + x_2 + x_3 = 5$

$x_1 \ge 0, x_2 \ge 0$ and $x_3 \ge 0.$

18. There are 5 jobs each of which is to be processed through two machines M_1 and M_2 in the order M_1, M_2. Processing hours are given below.

Job :	**A**	**B**	**C**	**D**	**E**
M_1 (time in hrs) :	4	9	6	8	5
M_2 (time in hrs) :	5	11	7	6	9

1) Determine optimum sequence for the job. Also find total minimum time elapsed. Find also the ideal time of the two machines.

19. Solve the following LPP by Big. M method.

Min : $Z = 5x_1 + 6x_2$

S.t : $2x_1 + 5x_2 \ge 1500$

$3x_1 + x_2 \ge 1200$

$x_1 \ge 0$ and $x_2 \ge 0.$

20. Distinguish between AP and TP.

21. Explain how 'n' jobs on 'm' machines problem can be solved. **(Wt : 7×2=14)**

Answer **any two** questions (**Wt : 4 each**).

22. Solve by two phase method.

Min : $t = 6x_1 + 5x_2$

S.t : $2x_1 + x_2 \ge 80$

$x_1 + 2x_2 \ge 60$

$x_1 \ge 0\ ;\ x_2 \ge 0.$

23. The following table lists the jobs of a network along with their time estimate.

Job	Duration (days)		
i j	Optimistic	Most likely	Pessimistic
1 – 2	3	6	15
1 – 6	2	5	14
2 – 3	6	12	30
2 – 4	2	5	8
3 – 5	5	11	17
4 – 5	3	6	15
6 – 7	3	9	27
5 – 8	1	4	7
7 – 8	4	19	28

1) Draw the project network.

2) Calculate the length and variance of critical path.

3) Find due data which has 95% chance to meet.

24. Solve the following TP.

		To					
		W_1	W_2	W_3	W_4	W_5	Available
From	F_1	3	4	6	8	9	20
	F_2	2	10	1	5	8	30
	F_3	7	11	20	40	3	15
	F_4	2	1	9	14	16	13
Required		40	6	8	18	6	

(Wt : 2×4=8)
